



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/567,413	02/03/2006	Xiang Li	133697-0022	5182

35684 7590 11/13/2008

BUTZEL LONG  
IP DOCKETING DEPT  
350 SOUTH MAIN STREET  
SUITE 300  
ANN ARBOR, MI 48104

EXAMINER
----------

FORTUNA, ANA M

ART UNIT	PAPER NUMBER
----------	--------------

1797

NOTIFICATION DATE	DELIVERY MODE
-------------------	---------------

11/13/2008

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATENT@BUTZEL.COM  
BOUDRIE@BUTZEL.COM

<b>Office Action Summary</b>	<b>Application No.</b> 10/567,413	<b>Applicant(s)</b> LI ET AL.	
	<b>Examiner</b> Ana M. Fortuna	<b>Art Unit</b> 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 08 August 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>7/31/06</u> .   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

1. Claims 1-8, 10-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1 and 14 recite the limitation "quick evaporation", the claim is indefinite regarding to the evaporation time, and what time can be considered to be corresponding with the "quick evaporation" term.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morikawa et al (US 7,258,914) in view of Nohmi et al (US 4,399,035).

Morikawa ('913) discloses the process of making a hollow fiber PVDF membrane from a composition or dope including PVDF in the range of 5 to 30% (abstract, column 11, lines 36-column 12, line 9), organic and inorganic additives, e.g. polyhydric alcohol, surfactants (less than 50 %), lithium chloride, solvents and non-solvents (column 11, 58-61, column 12, lines 34-59). The percentage of inorganic additives is not clearly disclosed, however adding a pore former, e.g. nonsolvent in a range between 50 % or less is disclosed, both organic and inorganic are disclosed in this patent, therefore adjusting the amount of nonsolvent (pore former) at a concentration of less than 30 %,

Art Unit: 1797

as in the present invention would have been obvious to the skilled artisan depending on the final pore structure desired, e.g the sponge structure containing pores resulting in the final membrane is larger when the amount of pore forming additives is larger; the solvent is added to make up the solution to a 100% composition. The membrane in '913 is formed by extrusion by simultaneously discharging resin solution from a extrusion on head and passing a lumen forming fluid, liquid or gas, which in the case of liquid can be a solvent or nonsolvent (column 12, last paragraph-column 13, lines 22). The membrane is formed by phase inversion in a cooling bath containing solvent and/or non solvent (column 13, lines 23-50, column 10, lines 41-38, column 12, last paragraph bridging with column 13). The membrane pores at the inner side and at the outside are controlled by controlling the lumen and bath liquid composition and temperatures. The skilled artisan at the time the invention was made can be able to predict that by increasing the amount of polymer solvent in the lumen to forming liquid and bath formation of asking surface at both membrane surface can be controlled, the same is predictable by controlling the temperature of the fluids with larger pores produced when the temperature is high and lower pores at the surface when the temperature is reduced. Skin at both surfaces is illustrated in Fig. 4).

Patent '914, as discussed above make the membrane from polymer solutions, however, hollow fiber membranes can be made from a single solution in a conventional double tube spinneret, as evidenced by patent '035. Patent '035 teaches making PVDF hollow fiber membranes by extruding a single dope containing solvent ad surfactant and using an annulus forming liquid and a liquid bath (abstract, column 23, lines 5 through column

Art Unit: 1797

24, line 28). The later section teaches the coagulation bath, drying and second and treatment in a second (water) bath to wet the membrane. It would have been obvious to one skilled in the art at the time this invention was made to alternatively make the hollow fiber membrane with the composition of '914 from either of the two known process of making hollow fiber membranes with a skin(s) and pore support at the inner side of the membrane as suggested for PVDF membrane material. Patent '035 teaches adding surfactant (organic additives) at a percentage of about 5 %, 22% of polymer, 22 % of polyethylene glycol and 30 % or more of a solvent for the polymer (column 17, lines 5-56). The addition of inorganic additives is not disclosed in patent'035, however, patent '914 teaches inorganic additives, such as lithium chloride as equivalent to organic pore formers, such as polyethylene glycol (column 12, lines 34-59), therefore, it would have been obvious to the skilled artisan at the time this invention was made to combine both kinds of pore former in dope when using the extrusion method of patent '035. The membrane in '035 shows skin layers and inner support with larger pore structure (Figures 6-7).

As to claim 2, the additives are discussed above. Patent '035 further suggests the addition of polyvinylpyrrolidone or polyvinyl alcohol (column 19, line 40-through column 20, line 3).

Limitations of claims 4-5 are discussed above. The percentages of solvent and non-solvents in claim 5 are not disclosed, however the skilled in the art at the time this invention was made can predict the type of inner pore surface that can be formed when 80 % of solvent for the polymer is used in the inner lumen fluid, e.g. a tight pore

Art Unit: 1797

structure can be expected. As to claim 6-7, the PVDF is commercially available, and the viscosity of the resin (in the dope solution) can be adjusted by controlling the amount of polymer and additives, as suggested in the art discussed above. As to claim 8, using PVP with high molecular weight the skilled artisan can expect an increase degree of hydrophilic properties in the final membrane, due to higher retention of the PVP in the membrane.

As to claims 9, the use of multiple coagulation baths of the same composition is considered to be cumulative. Evaporation or drying time is not disclosed, the skilled artisan at the time the invention was made would have been able to dry by evaporation to reduce the amount of residual solvent and/or non solvents present in the membrane pores, which are further removed in the coagulation bath and rinsing baths or water baths. As to claims 10-11, patent '035 suggest post-treating the membrane with hydrophilic agents to modify the hydrophobic PVDF surface with hydrophilic agents or surfactant to render the membrane hydrophilic is known in the art. The particular mixture is not disclosed in the proportions claimed, the treatment with the mixture is substantially equivalent of the treatment with surfactant alone in an equivalent amount of the total proportion of the components would have been obvious to one skilled in the art at the time this invention was made.

As to claims 12-13, the membrane pore size is disclosed in the references above, e.g. pores within the microporous range (see reference '035, abstract), based on the membrane pore size and hydrophilic properties, the skilled in this art can predict a similar water flux.

Art Unit: 1797

Claims 14-21 are covered by the discussion above.

### ***Conclusion***

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. References 6613688, 4,851210, 6,565,748, 7,351,338 are cited as teaching PVDF membranes made by membrane composition including solvents and nonsolvents, etc.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ana M. Fortuna whose telephone number is (571) 272-1141. The examiner can normally be reached on 9:30-6:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David R. Sample can be reached on (571) 272-1376. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Application/Control Number: 10/567,413  
Art Unit: 1797

Page 7

Ana M Fortuna  
Primary Examiner  
Art Unit 1797

/Ana M Fortuna/  
Primary Examiner, Art Unit 1797